

What is claimed is:

1. A method of viscosifying a treatment fluid comprising the steps of:  
providing a viscosifying agent that comprises a polymersome; and  
adding the viscosifying agent to the treatment fluid.
2. The method of claim 1 wherein the polymersome comprises a block copolymer that comprises a hydrophilic block and a hydrophobic block.
3. The method of claim 2 wherein the hydrophilic block is present in the block copolymer in an amount in the range of from about 20% to about 45% by weight of the block copolymer.
4. The method of claim 2 wherein the hydrophilic block comprises poly(acrylic acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).
5. The method of claim 2 wherein the hydrophobic block comprises poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or poly(ethylene butene).
6. The method of claim 1 wherein the viscosifying agent is added to the treatment fluid in an amount such that the polymersome is included in the viscosifying treatment fluid in an amount in the range of from about 0.01% to about 1.0% by weight of the treatment fluid.
7. The method of claim 1 wherein the treatment fluid comprises an aqueous-based component.
8. The method of claim 1 wherein the treatment fluid is useful in a subterranean application.
9. The method of claim 1 wherein the treatment fluid is a drilling fluid, a drill-in fluid, a fracturing fluid, or a gravel pack fluid.
10. The method of claim 1 wherein the treatment fluid further comprises particulates.

11. A method of suspending particulates in a treatment fluid comprising the steps of:  
providing a viscosifying agent that comprises a polymersome;  
adding the viscosifying agent to the treatment fluid; and  
adding particulates to the treatment fluid so that they are at least partially  
suspended therein.
12. The method of claim 11 wherein the polymersome comprises a block copolymer  
that comprises a hydrophilic block and a hydrophobic block.
13. The method of claim 12 wherein the block copolymer has a hydrophilic mass  
fraction in the range of from about 20% to about 45% by weight of the block copolymer.
14. The method of claim 12 wherein the hydrophilic block comprises poly(acrylic  
acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane  
sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).
15. The method of claim 12 wherein the hydrophobic block comprises  
poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or  
poly(ethylene butene).
16. The method of claim 11 wherein the viscosifying agent is added to the treatment  
fluid in an amount such that the polymersome is included in the viscosifying treatment fluid in an  
amount in the range of from about 0.01% to about 1.0% by weight of the treatment fluid.
17. The method of claim 11 wherein the treatment fluid comprises an aqueous-based  
component.
18. The method of claim 11 wherein the treatment fluid is a fracturing fluid or a  
gravel pack fluid.

19. A method of treating a section of a subterranean formation comprising the steps of:

providing a viscosified treatment fluid that comprises  
an aqueous-based component, and  
a viscosifying agent that comprises a polymersome; and  
treating the section of the subterranean formation.

20. The method of claim 19 wherein the polymersome comprises a block copolymer that comprises a hydrophilic block and a hydrophobic block.

21. The method of claim 20 wherein the block copolymer has a hydrophilic mass fraction in the range of from about 20% to about 45% by weight of the block copolymer.

22. The method of claim 20 wherein the hydrophilic block comprises poly(acrylic acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).

23. The method of claim 20 wherein the hydrophobic block comprises poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or poly(ethylene butene).

24. The method of claim 19 wherein the viscosifying agent is added to the viscosified treatment fluid in an amount such that the polymersome is included in the viscosified treatment fluid in an amount in the range of from about 0.01% to about 1.0% by weight of the viscosified treatment fluid.

25. The method of claim 19 wherein the viscosified treatment fluid is a drilling fluid, a drill-in fluid, a fracturing fluid, or a gravel pack fluid.

26. The method of claim 19 wherein the viscosified treatment fluid further comprises particulates.

27. The method of claim 19 wherein the viscosified treatment fluid further comprises a buffer.

28. The method of claim 19 wherein the treatment fluid further comprises an encapsulated pH-adjusting agent, a base-releasing material, or an acid-releasing material.

29. The method of claim 19 further comprising the step of reducing the viscosity of the viscosified treatment fluid.

30. The method of claim 29 wherein the step of reducing the viscosity of the viscosified treatment fluid involves raising the pH of the viscosified treatment fluid.

31. The method of claim 29 wherein the step of reducing the viscosity of the viscosified treatment fluid involves reducing the pH of the viscosified treatment fluid.

32. A method of fracturing a subterranean formation comprising the steps of:  
providing a fracturing fluid that comprises  
an aqueous-based component, and  
a viscosifying agent that comprises a polymersome; and  
placing the fracturing fluid into the subterranean formation at a pressure sufficient to create or enhance at least one fracture therein.
33. The method of claim 32 wherein the polymersome comprises a block copolymer that comprises a hydrophilic block and a hydrophobic block.
34. The method of claim 33 wherein the block copolymer has a hydrophilic mass fraction in the range of from about 20% to about 45% by weight of the block copolymer.
35. The method of claim 33 wherein the hydrophilic block comprises poly(acrylic acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).
36. The method of claim 33 wherein the hydrophobic block comprises poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or poly(ethylene butene).
37. The method of claim 32 wherein the viscosifying agent is added to the fracturing fluid in an amount such that the polymersome is included in the fracturing fluid in an amount in the range of from about 0.01% to about 1.0% by weight of the fracturing fluid.
38. The method of claim 32 wherein the fracturing fluid further comprises particulates.
39. The method of claim 32 further comprising the step of reducing the viscosity of the fracturing fluid.

40. A method of providing sand control in a section of a subterranean formation comprising the steps of:

providing a gravel pack fluid that comprises  
an aqueous-based component,  
a viscosifying agent that comprises a polymersome, and  
particulates; and

introducing the gravel pack fluid to the section, such that the particulates form a gravel pack in or neighboring the section.

41. The method of claim 40 wherein the polymersome comprises a block copolymer that comprises a hydrophilic block and a hydrophobic block.

42. The method of claim 41 wherein the block copolymer has a hydrophilic mass fraction in the range of from about 20% to about 45% by weight of the block copolymer.

43. The method of claim 41 wherein the hydrophilic block comprises poly(acrylic acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).

44. The method of claim 41 wherein the hydrophobic block comprises poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or poly(ethylene butene).

45. The method of claim 40 wherein the viscosifying agent is added to the gravel pack fluid in an amount such that the polymersome is included in the gravel pack fluid in an amount in the range of from about 0.01% to about 1.0% by weight of the gravel pack fluid.

46. The method of claim 40 wherein the particulates comprise gravel.

47. The method of claim 40 further comprising the step of reducing the viscosity of the gravel pack fluid.

48. A method of encapsulating a treatment fluid additive comprising the steps of:  
providing block copolymers that comprise a hydrophilic block and a hydrophobic block; and

preparing at least one polymersome comprising a hydrophilic core from the block copolymers in the presence of the treatment fluid additive, wherein the polymersome encapsulates at least a portion of the treatment fluid additive within the polymersome.

49. The method of claim 48 wherein the step of preparing the at least one polymersome is performed by solvent injection.

50. The method of claim 48 wherein the block copolymer has a hydrophilic mass fraction in the range of from about 20% to about 45% by weight of the block copolymer.

51. The method of claim 48 wherein the hydrophilic block comprises poly(acrylic acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).

52. The method of claim 48 wherein the hydrophobic block comprises poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or poly(ethylene butene).

53. The method of claim 48 wherein the treatment fluid additive comprises a gel breaker, an emulsion breaker, a scale inhibitor, an emulsion inhibitor, a gas hydrate inhibitor, a paraffin inhibitor, or a corrosion inhibitor.

54. A viscosified treatment fluid that comprises:  
an aqueous-based component; and  
a viscosifying agent that comprises a polymersome.
55. The viscosified treatment fluid of claim 54 wherein the polymersome comprises a block copolymer that comprises a hydrophilic block and a hydrophobic block.
56. The viscosified treatment fluid of claim 55 wherein the block copolymer has a hydrophilic mass fraction in the range of from about 20% to about 45% by weight of the block copolymer.
57. The viscosified treatment fluid of claim 55 wherein the hydrophilic block comprises poly(acrylic acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).
58. The viscosified treatment fluid of claim 55 wherein the hydrophobic block comprises poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or poly(ethylene butene).
59. The viscosified treatment fluid of claim 54 wherein the viscosifying agent is added to the viscosified treatment fluid in an amount such that the polymersome is included in the viscosified treatment fluid in an amount in the range of from about 0.01% to about 1.0% by weight of the viscosified treatment fluid.
60. The viscosified treatment fluid of claim 54 wherein the viscosified treatment fluid is a drilling fluid, a drill-in fluid, a fracturing fluid, or a gravel pack fluid.
61. The viscosified treatment fluid of claim 54 wherein the viscosified treatment fluid further comprises particulates.
62. The viscosified treatment fluid of claim 54 wherein the viscosified treatment fluid further comprises a buffer.
63. The viscosified treatment fluid of claim 54 wherein the treatment fluid further comprises an encapsulated pH-adjusting agent, a base-releasing material, or an acid-releasing material.
64. The viscosified treatment fluid of claim 63 wherein the acid-releasing material comprises an orthoester; a poly(ortho ester), a lactide; a poly(lactide); a glycolide; a poly(glycolide); a substituted lactide; a substantially water insoluble anhydride; or a poly(anhydride).



65. The viscosified treatment fluid of claim 63 wherein the base-releasing material comprises urea, ulexite, or a blend thereof.

66. The viscosified treatment fluid of claim 63 wherein the pH-adjusting agent comprises sodium hydroxide, potassium hydroxide, lithium hydroxide, sodium carbonate, potassium carbonate, fumaric acid, formic acid, acetic acid, acetic anhydride, hydrochloric acid, hydrofluoric acid, hydroxyfluoboric acid, polyaspartic acid, or polysuccinimide.

67. A fracturing fluid that comprises:  
an aqueous-based component; and  
a viscosifying agent that comprises a polymersome.
68. The fracturing fluid of claim 67 wherein the polymersome comprises a block copolymer that comprises a hydrophilic block and a hydrophobic block.
69. The fracturing fluid of claim 68 wherein the block copolymer has a hydrophilic mass fraction in the range of from about 20% to about 45% by weight of the block copolymer.
70. The fracturing fluid of claim 68 wherein the hydrophilic block comprises poly(acrylic acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).
71. The fracturing fluid of claim 68 wherein the hydrophobic block comprises poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or poly(ethylene butene).
72. The fracturing fluid of claim 67 wherein the viscosifying agent is added to the fracturing fluid in an amount such that the polymersome is included in the fracturing fluid in an amount in the range of from about 0.01% to about 1.0% by weight of the fracturing fluid.
73. The fracturing fluid of claim 67 wherein the fracturing fluid further comprises particulates.
74. The fracturing fluid of claim 67 wherein the fracturing fluid further comprises a buffer.
75. The fracturing fluid of claim 67 wherein the fracturing fluid further comprises an encapsulated pH-adjusting agent, a base-releasing material, or an acid-releasing material.

76. A gravel pack fluid that comprises:  
an aqueous-based component,  
a viscosifying agent that comprises a polymersome; and  
particulates.
77. The gravel pack fluid of claim 76 wherein the polymersome comprises a block copolymer that comprises a hydrophilic block and a hydrophobic block.
78. The gravel pack fluid of claim 77 wherein the block copolymer has a hydrophilic mass fraction in the range of from about 20% to about 45% by weight of the block copolymer.
79. The gravel pack fluid of claim 77 wherein the hydrophilic block comprises poly(acrylic acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).
80. The gravel pack fluid of claim 77 wherein the hydrophobic block comprises poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or poly(ethylene butene).
81. The gravel pack fluid of claim 76 wherein the viscosifying agent is added to the gravel pack fluid in an amount such that the polymersome is included in the gravel pack fluid in an amount in the range of from about 0.01% to about 1.0% by weight of the gravel pack fluid.
82. The gravel pack fluid of claim 76 wherein the particulates comprise gravel.
83. The gravel pack fluid of claim 76 wherein the gravel pack fluid further comprises a buffer.
84. The gravel pack fluid of claim 76 wherein the gravel pack fluid further comprises an encapsulated pH-adjusting agent, a base-releasing material, or an acid-releasing material.

85. A polymersome that comprises a block copolymer comprising poly(butadiene) and poly(acrylic acid).

86. The method of claim 85 wherein the block copolymer has a poly(acrylic acid) mass fraction in the range of from about 20% to about 45% by weight of the block copolymer.

87. The method of claim 85 wherein the polymersome is prepared by solvent injection.

88. An encapsulated treatment fluid additive for use in a subterranean environment, the encapsulated treatment fluid additive comprising a treatment fluid additive encapsulated within a polymersome.

89. The encapsulated treatment fluid additive of claim 88 wherein the polymersome comprises a block copolymer that comprises a hydrophilic block and a hydrophobic block.

90. The encapsulated treatment fluid additive of claim 89 wherein the block copolymer has a hydrophilic mass fraction in the range of from about 20% to about 45% by weight of the block copolymer.

91. The encapsulated treatment fluid additive of claim 89 wherein the hydrophilic block comprises poly(acrylic acid), poly(ethylene oxide), poly(methacrylic acid), poly(2-acrylamido, 2-methyl propane sulfonic acid), poly(2-dimethylaminoethyl methacrylate), or poly(acrylamide).

92. The encapsulated treatment fluid additive of claim 89 wherein the hydrophobic block comprises poly(butadiene), poly(styrene), poly(isoprene), poly(ethylene), poly(ethylene propylene), or poly(ethylene butene).

93. The encapsulated treatment fluid additive of claim 88 wherein the treatment fluid additive comprises a gel breaker, an emulsion breaker, a scale inhibitor, an emulsion inhibitor, a gas hydrate inhibitor, a paraffin inhibitor, or a corrosion inhibitor.